Complex Predicates and the Functional Sequence

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Abstract

In this paper I argue that a fine-grained functional hierarchy of semantically contentful categories such as Tense, Aspect, Initiation, and Process has explanatory power in understanding the cross-linguistic distribution of complex predicates. Complex predicates may involve adjunction, control, or raising, and show other variables as well. In a Minimalist framework, specific parameters cannot be invoked to allow or disallow different kinds of serial verbs, light verbs, resultatives, and so on. Instead, what variation is observed must come from the specifications of lexical items. This places a great burden on the learner, a burden which, I argue, is partly alleviated by the functional sequence.

1. Introduction

The term 'complex predicate' is understood in a number of ways, many of which are unlikely to correspond to actual classes from a linguistic point of view. In the broadest possible descriptive sense, any predicate that consists of more than one piece is complex, and if we include pieces which are not phonologically overt, then possibly all predicates are complex (cf. Hale and Keyser 1997).

Even when the notion is reined in to refer only to such things as most people agree are complex predicates (e.g. serial verb constructions and light verb constructions), either the boundaries are unclear or some of the definitional criteria are selected for convenience rather than on the basis of sound theoretical criteria.

In this paper, I do not attempt to define a single linguistically valid class of complex predicate. Instead, I try to motivate the importance of a hierarchy of functional categories (what Starke 2001; 2004 calls the functional sequence) in understanding the variety of things that are called complex predicates. In so doing I outline a framework in which serial verbs, light

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verb constructions, auxiliaries, and other elements can be understood as part of a single system.

Essentially, the argument runs as follows. If we allow ourselves the analytic tools that we generally make use of in descriptions of complex predicate structures, then the range of possible analyses of complex predicates is immense. This leads to a learnability problem — if learners encounter a sequence of elements X Y which together serve a predicative function, and do not know a priori which is the head, whether those elements are adjoined or in a complement relation, what features either one bears, and so on, then the analytic space is quite large. If this were the case, then learners should settle on rather different solutions.

However, there are at least two indications that learners do not settle on very different solutions. First, at least some complex predicate constructions are learned well, as is evident from the fact that very subtle properties that they can manifest in language-specific ways are stable across speech communities. Second, unrelated languages in different parts of the world have settled on complex predicate structures with similar properties, which would not be likely to happen if the range of analytic possibilities were as great as it appears to be at first.

Therefore, it is incumbent on the linguist to discover what properties constrain the range of possible complex predicate constructions. I suggest that the functional sequence provides a very powerful constraint. It imposes a particular templatic structure on every clause, which is a link between syntax and semantics. This allows the learner to infer syntactic properties from the semantics of a complex predicate construction, and vice-versa.

2. The variety of complex predicates

It is common, in discussions of complex predicates, to restrict the domain being discussed to a tractable set of cases, for example setting aside adverbials, auxiliaries, or depictives as being distinct from complex predicates per se. However, it can be instructive to consider the full range of situations in which a predicate consists of more than one part, in order to appreciate the challenge to the learner and in order to see the properties of the system in which the more narrowly defined kind of complex predicates are contained. Thus, I set aside only two things at the outset: noun phrase arguments (along with their dependents) and subordinate clauses (though I briefly discuss the difficulty in knowing how to identify a subordinate clause in some cases).

2.1. The range of meanings of complex predicates

As discussed further below, complex predicates may include a wide range of categories, but typically one piece is either a verb or an auxiliary, and stands in a direct relation to tense or aspect. For convenience, I will refer

to this one as the higher predicate, anticipating the analysis below, and the other as the lower one.

Classic examples of complex predicate constructions include those where the higher predicate describes an event and the lower one describes a resultant state (resultative), a concomitant situation (depictive), a subsequent event (consequential), or an intended objective (purposive) of the higher one.

In another large class of complex predicate constructions, called light verb constructions, it is less clear that the higher predicate describes an event; often it does not seem terribly descriptive, though in many cases it signals argument structure or Aktionsart. In these cases the more descriptive (lower) predicate is often called a coverb; it may be a verb, an adjective, a noun, or may even be drawn from a distinct class altogether.

Related to these constructions are a host of causative and permissive constructions, in which the higher predicate expresses some sort of causation or permission of the event described by the lower one. Benefactive, malefactive, instrumental, and desiderative notions may be expressed in this sort of configuration.

When a functional verbal element is paired with a more descriptive predicate, the functional element may express aspectual, temporal, modal, or evidential notions. In such cases we generally refer to the functional element as an auxiliary, rather than as a light verb, and exclude it from the class of complex predicates (Butt 1995; 1997); but the boundary may not be sharp. I will return to this matter below.

Thus, there is a quite a range of different meanings that a pair of predicative elements X Y might express, in a given language. The learner had better be paying close attention.

Worse yet, there are fine-grained meaning distinctions even among these different categories. For example, Washio (1997) argues for a basic distinction between true and 'spurious' resultatives, where the spurious ones are more adverbial in nature (e.g. *tie his wrists tight/tightly*; Geuder 2000 calls them resultative adverbials and Levinson 2007 calls them pseudo-resultatives; see also Kratzer to appear).

Washio (1997) furthermore argues for subtly different conditions on the predicate in resultative conditions in English, Japanese, and the Romance languages, having to do with whether the result state is a natural consequence of the event described by the higher predicate. This means that for the learner, it is not enough to notice that a language has resultatives, he or she must also notice which kind (this is discussed further in §2.2).

2.2. The range of structural configurations

Now, it might be the case that the context of use will provide the learner with some good clues about the meaning of a complex predicate construction, and there will often be salient and frequent clues about the lexical

categories of words; but when it comes to the structural configuration of the two (or more) predicates, the evidence is usually much subtler.

2.2.1. Adjunct vs. Complement, Modifier vs. Copredicate

Linguists have argued at length and in great detail for different structural positions and configurations for different predicates, especially the one that I have been calling the lower one. I do not wish here to settle questions of whether there are lexical rules, or whether there are semantic parameters, and so on, but simply want to gauge the total number of distinctions necessary.

For instance, a given case of complex predication might be analyzed as predicate merger in a lexical component (Williams 1997, Butt 1997), control (Stowell 1983, Simpson 1983), some kind of relativization (Baker and Stewart 2002), raising (Hoekstra 1988, Ramchand and Svenonius 2002, Kratzer to appear), a rule of semantic interpretation (Dowty 1979, Goldberg and Jackendoff 2004), or some other mechanism. But what is important here is whether one mechanism can be posited for all cases of complex predication; if so, that's one less learning problem. If there are several types, then the task for the learner is more difficult.

Generally speaking, it seems that there are three irreducible classes of analyses of complex predicates.

(1) Main classes of complex predicates
   a. Lower predicate is complement of higher predicate
   b. Lower predicate is adjunct, predicated of the event
   c. Lower predicate is adjunct, predicated of an argument

To establish that these cannot be fully reduced to one or two types, I discuss two minimal pairs; a pair of resultative constructions in which one is a predicate of an event while the other is a predicate of an argument, and then a pair in which one resultative predicate is an adjunct predicate of an argument, and the other is a complement predicated over the argument. If my argument is successful, it will have established that a learner, upon encountering a complex predicate, will in some cases have to choose from among at least three different structural configurations.

Recall the distinction between 'spurious' and 'true' resultatives. In a true resultative, the resultative predicate is predicated of the internal object; examples are presented in (2).

(2) a. They kicked the door open.
   b. They drank the bar dry.
   c. He pulled his shoelaces loose.

A normal resultative can be paraphrased as a causative: They made the door become open by kicking it; they made the bar become dry by drinking;

he made his shoelaces become loose by pulling.

In an adverbial resultative, the resultative is predicated of the result state, not of the object, as illustrated in (3).

(3) a. He tied his shoelaces loose.
b. They cut the cheese thick.
c. We opened the door wide.

In these examples, it is the result of the activity that is loose, thick, or wide. Unlike in a normal resultative, the causative paraphrase doesn't work; (3c) does not mean 'He caused his shoelaces to become loose by tying them.'

In many cases, adverbial forms can be substituted for adverbial resultatives, while this is not the case for true resultatives.

(4) a. He tied his shoelaces loosely.
b. They cut the cheese thinly.
c. They loaded the car heavily.

Washio (1997) documents several differences between the two types of resultatives in Japanese. Takamine (2007) shows that the two types of resultatives in Japanese have different properties, and can cooccur.

Following Washio (1997), Geuder (2000), Takamine (2007), among others, I take it as established that there are resultatives which predicate of an argument and that these are structurally distinct from those which predicate of the result state or subevent.

However, there is another distinction as well, among resultatives, as convincingly demonstrated by Washio (1997) and Kratzer (to appear). English and German, but not Japanese or Korean, allow what Washio calls 'strong' resultatives. Strong resultatives are those in which there is no entailment from the lexical semantics of the verb of a result state for the object. The clearest case of a strong resultative is the unselected resultative, such as those in (5). Kratzer (to appear) argues for a raising analysis in which the resultative predicate is a complement of the verb (following Hoekstra 1988).

Unselected resultatives are different from the other structures discussed in that the resultative expression is not optional.

(5) a. They drank the teapot *(dry).
b. We talked ourselves *(silly).

The usual approach is to fully or partly unify the strong and weak resultatives, e.g. as Ramchand and Svenonius (2002) do by introducing a certain degree of flexibility in the thematic role assignment. But Kratzer (to appear) stresses the difference. For example, she points out a difference in the possibilities of extraction of the two types: Weak resultatives and adverbial resultatives regularly allow the resultative expression to be questioned, in English and German, whereas unselected resultatives do not.

(6) a. How did you hammer the metal? – Flat.
b. How did they paint the wall? – Blue.
c. How did they load the truck? – Heavy.
d. *How did you drink the teapot? – Dry.
e. *How did they talk themselves? – Silly.

Kratzer (to appear) presents additional arguments that weak resultatives are importantly different structurally from the strong resultatives of English. Thus, it seems necessary even within a fairly circumscribed semantic domain to admit the possibility of at least three different strategies of combining two predicates, as noted above: event modifiers (as with the 'spurious' or adverbial resultatives), copredicate adjuncts (as with the 'weak' resultatives), and complement copredicates (as with unselected resultatives).

2.2.2. Height of adjuncts

Another main distinction among analyses of complex predicates concerns the question of how high the lower predicate is attached, when it is an adjunct.

For example, Simpson (1983) showed that resultatives in English are attached deeper within the verb phrase than are depictives, and Legendre (1997) argues for a three-way distinction in attachment height for different French secondary predicates. Baker and Stewart (2002), Baker (2005) also argue for different attachment heights for different kinds of serial verb constructions. For example, in the Nupe example in (7), the verb *bé* 'come' appears along with a verb phrase followed by a 'purpose' marker *zì*.

(7) Musa bé etsi (yin) du zì.
Musa come yam PRT *cook* PURP
'Musa came to cook the yam' (Nupe, Baker and Stewart 2002:54)

They use this 'purpose' marker to show the different attachment heights of two distinct adjunct serial verb types, the one they call the 'consequential' and the one they call the 'purposive.' The differing positions of the two serial verb phrases with respect to *zì* is shown in (8); (8a) is the consequential and (8b) is the purposive.

(8) a. Musa bé etsi (yin) du kun zi.
Musa come yam PRT *cook sell* PURP
'Musa came to cook the yam and sell it'
b. (?)Musa bé nangi wan zì ya tsigbè.
Musa come goat catch PURP *give medicine*
'Musa came to catch a goat to give it medicine' (Nupe, Baker and Stewart 2002:54)

The relative size of the adjunct may vary as well; Simpson (1983) argues that depictives are small clauses which contain PRO, while resultatives are

not; Legendre (1997) argues that French secondary predicates are AgrP, and Baker and Stewart (2002) argue for different sizes for the different kinds of secondary predicate. For example, they argue that the consequential serial verb phrase is a *v*P, containing a causative head but no tense, aspect, or mood, while the purposive serial verb phrase is a larger constituent, containing a mood head. This is observed in two ways: First, the interpretation of the purposive is irrealis, in that it it not asserted to have occurred, and second, there is a high tone on the verb. This is indicated in (9), where the consequential verb matches the main verb in tone, obligatorily. (9a) is the consequential and (9b) is the purposive.

(9) a. Òzó ghá gbè èwé khièn.
Ozo FUT *hit goat sell*
'Ozo will kill the goat and sell it'
b. Òzó ghá mièn ìyán èvá lé.
Ozo FUT *find yam two cook*
'Ozo will find two yams to cook (and do so)' (Edo, Baker and Stewart 2002:19)

In some analyses, the lower predicates are taken to be entire clauses, with defective projections. These different options are summed up in (10).

(10) Analytic options for adjunct secondary predicates
a. How high is the adjunct attached
b. How much functional structure dominates the adjunct

2.2.3. Complements

For complement structures as well, there are several different analytic options. First, there is the question of the size of the embedded predicate, whether it is a lexical projection, a small clause, a full clause, or something in between. Wurmbrand (2001) develops an analysis in which verbal projections of four different sizes can be embedded under a selecting verb (CP, TP, *v*P, and VP). If there are more functional projections, then there are in principle more possibilities, though we might try to dodge the bullet at this point by saying that multiclausal structures are not complex predicates and therefore not our problem.

However, it can be difficult to decide which structures are monoclausal. Recall that restructuring verbs can be diagnosed by apparently clause-bounded phenomena such as clitic climbing (cf. (15) in §3.1), and such verbs are given a monoclausal analysis by Cinque (2004), for example (along with verbs with meanings like 'like,' 'start,' 'tend,' etc.). Note that even within the same language, a verb might have two possibilities; Cinque takes the possibility of repeating a temporal/aspectual adverb in the domain of each verb as an indication of biclausality; in such contexts, clitic climbing is impossible.

(11) a. Maria vorrebbe già aver-lo già lasciato.
Maria would.want already have-him already left
'Maria would already want to have already left him'
b. *Maria lo vorrebbe già aver già lasciato.
Maria would.want already have-him already left
(Italian, Cinque (2004:138))

Aboh (2005) adopts a kind of combination of the two positions for serial verb constructions in Gbe; like Cinque, he argues that Gbe has semilexical verbs, but he argues that they dominate full clausal structures, even when those structures have no finite tense.

The options are summed up in (12).

(12) Analytic options for complement secondary predicates
a. What is the categorial status of the higher predicate
b. How much structure does the lower predicate project

These different analytic possibilities raise the acquisitional stakes tremendously; in addition to having to figure out what the construction means, what the categories are of the predicates, and what features the two predicates bear, the learner also has to figure out whether the two are related by complementation or by adjunction, which is the head, how high the adjunct is attached, and what functional or modificational structure is allowed to dominate each. The learning task would seem at this point to be insuperable without some guidance.

3. The systematicity of complex predicates

The astonishing variety of predicate structures could be understood to mean that universal grammar does not tightly constrain natural languages, and that just about anything can be learned.

However, there are at least two indications that this is not the case. First, despite the variety, clear cross-linguistic patterns emerge. I discuss some of these in §3.1. Second, there are systematic subtleties in these constructions which are learned despite being underdetermined by the primary data. I discuss some examples in §3.2.

3.1. Cross-linguistic tendencies

3.1.1. Tense, Mood, Aspect

An important generalization is the way that tense, mood, modality, and aspect (TMA) are distributed in the clause. As shown by Bybee (1985), Cinque (1999), and Julien (2002), aspect is closest to the verb stem, followed by tense, followed by mood (subjunctive, conditional, indicative, etc.). This applies whether the markers are postverbal or preverbal.

(13) a. mə́ á ŋgə wííŋg òmpyə̂
I PAST PROG chase.away dogs
'I was chasing the dogs away' (Makaa, Julien 2002:202)
b. ni-k-kak-to-s
1sS-3sO-*hear*-DUR-FUT
'I will be hearing it' (North Puebla Nahuatl, Brockaway 1979:179)

If there is an auxiliary, it can bear just tense, leaving aspect to the verb, as in the Finnish example in (14b), or it can bear tense and aspect, but the auxiliary cannot bear aspect while the verb bears tense (Julien 2002).

(14) a. Nous-i-n.
get.up-PAST-1SG
'I got up'
b. Ol-i-n nous-sut.
be-PAST-1SG *get.up*-PERF
'I had gotten up' (Finnish, Holmberg and Nikanne 1993)

The auxiliary may lack decriptive content, serving simply as a bearer of mood, tense, aspect and agreement. See Steele (1978; 1981), Akmajian et al. (1979) for early discussion of the properties of auxiliaries.

In §2.1 I noted that in most complex predicates, there is one element which stands in a special relationship to tense or aspect, and I referred to that element as the 'higher' predicate.

In fact, this is so overwhelmingly true that it is tempting to hypothesize that it is a universal, and to study the putative counterexamples to see if they are truly counterexamples.

Double-headed analyses of complex predicates (e.g. Schachter 1974, Baker 1989, Baker and Stewart 1999) have never gained much support and most have been abandoned even by their creators (cf. Baker 2005, Baker and Stewart 2002). The strong hypothesis is therefore tenable that all non-coordinate natural language phrases have a unique head (as entailed by the proposals of Kayne 1994 and Chomsky 1995).

3.1.2. Modals and restructuring verbs

Sometimes, a verb with certain kinds of meanings appears to have auxiliary-like properties, in that it interacts with TMA operators, and allows the main verb to remain non-finite, but the main verb shows no signs of being optional or adjoined, and the structure appears to be monoclausal. These are sometimes called restructuring verbs (see e.g. Cinque 2004, Wurmbrand to appear).

I illustrate with Italian, a well-studied case. Clitic pronouns may precede series of sufficiently closely integrated verbs in a phenomenon known as 'clitic climbing' (Rizzi 1978), and in this way distinguish verbs like *volere* 'want' from verbs such as *detestare* 'detest.'

(15) a. Lo volevo vedere subito.
*him wanted.*1SG *see* *immediately*
'I wanted to see him immediately'
b. *Lo detesto vedere in quello stato.
*him detested.*1SG *see* *in that* *state*
(Italian, Cinque (2004:132))

Thus, *volere* is known as a 'restructuring' verb.

The meanings of restructuring verbs can be modal; they can express trying, wanting, or needing; they can express temporal or aspectual content like tending to do something, or starting or finishing doing something; they can express causation or permission; or they can express motion, like 'come,' 'go,' and 'return' (though these verbs can also appear as light verbs and in serial verb constructions). Such verbs can bear the mood, tense, and/or aspect of a clause, allowing a more descriptive verb to be a 'lower' predicate.

Restructuring verbs may interact with auxiliaries, either appearing under them or taking them as complements.

3.1.3. Causatives and permissives

Causatives and permissives may appear as restructuring verbs, or as light verbs; an example analyzed by Butt is given in (16).

(16) Nadya-ne Saddaf-ko xat lih^{h}-ne di-ya.
Nadya-ERG *Saddaf*-DAT *letter write*-INF *give*-PERF
'Nadya let Saddaf write a letter' (Hindi/Urdu, Butt 2003)

Many languages distinguish 'inner' or 'direct' from 'outer' or 'indirect' causatives. The 'inner' type is characterized by a tighter relationship between the causative predicate and the embedded predicate. But in all cases it is clear that the causative predicate is the head, and takes the embedded predicate as a complement.

3.1.4. Light verbs

A pair of typical light verb contructions is shown in (17).

(17) a. Kamraa saaf huaa.
*room.*N *clean happen/become.*PERF
'The room became clean'
b. Raam-ne kamraa saaf kiyaa.
Ram-E *room.*N *clean do.*PERF
'Ram cleaned the room' (Hindi/Urdu, Mohanan 1994:201)

A light verb has relatively little descriptive content in its use as a light verb, though it may also have a main verb use which is descriptive. According to Butt (2003), every light verb has a main verb use; this can be referred

to as *Butt's Generalization*. Light verbs, unlike restructuring verbs, tend to exhibit a high degree of selectional restrictions on their complements. Light verbs may require that their complement be a particular category, they may require that their complement have a certain transitivity, and they may form an idiom with their complement.

In the examples in (17), the lower predicate is an adjective, but this varies considerably across light verb constructions. The lower predicate, variously called a 'coverb,' 'preverb,' 'ideophone,' or other names, may be drawn from any major lexical category, and may even belong to a category only used in light verb constructions.

3.1.5. Resultatives and directed motion constructions

Many languages allow a secondary resultative predicate, and the properties of these constructions vary immensely, as described in §2.2 and §3.2.

Resultatives are exceptional (along with some causative constructions) in allowing arguments that are clearly not shared between the two predicates, most clearly in what are called 'unselected' resultative constructions.

3.1.6. Serial verbs

There is also a highly recognizable archetype of serial verbs (see e.g. Baker 1989, Déchaine 1993, Durie 1997, Crowley 2002 and references there). Like the above cases, serial verbs describe a single event, in a single clause, without coordination. In a serial verb construction, the two (or more) verbs can occur independently as lexical verbs. They share a single tense, mood, aspect, and polarity, in that they cannot differ in their interpretations for these features; normally, serial verbs are only possible when tense is non-inflectional. In serial verb constructions, at least one argument is shared. As with light verb constructions, the collocation can be lexicalized and acquire an idiomatic meaning.

The connection of serial verb constructions to non-inflectional tense is quite striking, since the complex predicate constructions mentioned above all coexist with inflectional tense. For example, Baker and Stewart (2002) point out that while Nupe and Yoruba have no tense affixes and allow serial verbs systematically, the related language Igbo has tense affixes in every clause and cannot use serial verbs. Even more strikingly, another relative, Edo, has an affixal tense only in the past perfective, and precisely there Edo cannot use consecutive serial verb constructions.

There are limitations to this correspondence, however. As Baker and Stewart (2002) note, the purposive serial verb construction in Edo is compatible with the past perfective. Crowley (2002) shows that Paamese (an Oceanic language) has mood marking (e.g. irrealis) on both verbs. Aboh (2005) shows that in Gbe, there can be aspectual morphology on serial verbs.

3.1.7. Depictives, copredicates, relativization structures

There are other cases in which an argument is shared, which go under various names. One kind is depictives. Depictives express a state or property which holds of one of the arguments of the main predication (occasionally depictives can be predicated of an implicit argument, such as the agent of a passive). As Schultze-Berndt and Himmelmann (2004) show, languages can use depictive strategies to form a wide variety of adjunct types. Depictives are always optional.

Purposive clauses can be thought of in this way, as well as certain PPs.

3.1.8. Adverbials

There are so many kinds of adverbials that it seems quite fair to exclude them from consideration when trying to study complex predicates, as many researchers do. However, as I have repeatedly stressed here, the learner will have to be able to distinguish a predicate with an adverbial from a complex predicate of a different sort, and so it is necessary to know what the properties of adverbials are.

Adverbials are also optional (a verb may select an adverb, as with *behave*, but adverbials are by definition optional). They are normally not copredicated of the argument, but express properties of the event or the proposition.

A striking fact about adverbials is the relatively strict order they occur in, when they cooccur. This has been extensively studied for Greek by Alexiadou (1997), for Norwegian by Nilsen (1997), for Italian and English by Cinque (1999), for Malagasy by Rackowski and Travis (2000), and so on. I return to an explanation for this order in §4.3.

3.1.9. Summary

I have mentioned very many different phenomena here, and the variety may seem bewildering. However, the patterns are actually quite striking, when one considers the possibilities that are not manifested. For example, there are desiderative and volitional restructuring verbs, which characterize mental attitudes toward possible courses of action. These can be identified as restructuring verbs by the fact that they take tense and embed a lexical predicate without tense. And there are many kinds of resultative predicates which describe end states in rich detail, as I have discussed. But there are no resultative restructuring verbs. A resultative restructuring verb would be like a restructuring verb in taking tense and embedding a non-finite lexical verb, but would be like a resultative predicate in being able to express that the result of an action was to cause an object to become flat, or cooked, or dead. There are completive restructuring verbs with meanings like 'finish,' but they are bleached of descriptive lexical meaning.

Thus, the actual range of complex predicates is not limitless.

3.2. Systematic subtleties

Goldberg and Jackendoff (2004) present the complexity of the resultative construction in English as an argument for Construction Grammar, a framework which rejects Universal Grammar and argues that in principle, anything is learnable as language. Their argument is that there is a 'family' of English resultative constructions, varying slightly in different details, each of which must be learned semi-independently and stored as a construction. A parametric theory of Universal Grammar, they contend, could not possibly capture the richness of the construction.

Thus, they assume that learners are free to postulate a simple syntactic structure and then to acquire a language-specific mapping rule for connecting that to the appropriate semantic representation. However, this would seem to give the wrong results; it is not clear why English speakers, for example, would assign different structures to the resultative and the depictive.

On the face of it, a depictive construction and a resultative construction look rather similar. In fact, some strings are ambiguous between the two.

(18) a. The smith beat the metal hot.
b. The smith beat the metal flat.
c. The smith beat the metal cold.

In (18a), on the resultative reading, the metal becomes hot through beating. On the depictive reading, the metal was hot when it was beaten. (18b) is most naturally understood as resultative, and (18c) is most naturally understood as depictive.

Despite the similarity in outward syntax, Simpson showed that the two occupy different positions. Thus, for example, (19a) is fully acceptable, while (19b) is ungrammatical on the reading that (19a) has (and pragmatically odd on a reading where the metal becomes cold through being beaten while flat).

(19) a. The smith beat the metal flat cold.
b. *The smith beat the metal cold flat.

The structural distinction is backed up by constituency tests, as Simpson showed. For example, *do so* substitution shows that the depictive can be outside VP, while the resultative cannot be.

(20) a. The smith beat the metal cold, and the apprentice did so hot.
b. *The smith beat the metal flat, and the apprentice did so thin.

The judgments are fairly consistent across a large number of speakers of English. This sort of evidence convinces linguists of the structural distinctions, but these kinds of examples are exceedingly sparse in corpora.

Something must guide the learner to attach resultatives low, and de-

pictives somewhat higher in examples like (18), something which is not manifest in the morphology or word order of either.

Another striking and subtle fact about resultatives concerns certain constraints on the type of predicate. Quite generally, participles are not acceptable resultative predicates, even though participles make good adjectives and can appear in causative constructions.

(21) a. They beat the dog senseless/bloody/unconscious.
b. *They beat the dog injured/cowed/yelping.
c. They got the dog injured/cowed/yelping.

Similar observations can be made for all manner of other complex predicate constructions. Baker and Stewart's arguments that the purposive is attached higher in the clause are painstaking and subtle; if the learner were free to assume that purposive secondary predicates could be complements of the main verb, then why do speakers not vary in their judgments?

4. The functional sequence

There is substantial evidence that the clause can be divided into layers of structure which have certain syntactic and semantic characteristics. If we divide the clause into three general regions, then the lowest layer is the verb phrase, an event description in which arguments of the verb and adjuncts depicting characteristics of the event are located. Above this is the T-domain, an area in which tense, modal, and aspect operators and adverbials exists, along with some discourse-related subject and scrambling positions and possibly case-licensing positions. Above that again is the C-domain, which contains clause-typing functors (distinguishing interrogative from declarative force, for example) a topic position, possibly focus and *wh*-operator positions. These correspond to the syntactic categories V, T, and C in Chomsky (1986), to layers of predicate, proposition, and illocution in Dik (1989), and have analogues in many other frameworks.

Similarly, the noun phrase can be divided into some domains which correspond to the substance described by the noun, the quantity, and the discourse properties of the noun phrase. These correspond to syntactic categories N, Num, and D in Ritter (1991), or to the cognitive categories of Quality, Quantity, and Location in Rijkhoff (2002), for example.

In the functional, cognitive, and construction grammar frameworks, the layers are related to surface syntax and morphology by mapping rules and generalizations. In the Minimalist framework, the layers are related to surface syntax by movement and linearization rules.

More recently, the Cartography project has explored the hypothesis that the layers which can be ordered in this way is much more fine-grained than has previously been believed. In this approach, the layers are given syntactic category labels and an order is assigned to each pair. The resulting sequence of functional categories is sometimes called the functional sequence

(Starke 2001; 2004). In §4.1, I discuss the arguments for there being a functional sequence and in §4.2, I present a current idea of approximately what the sequence looks like.

4.1. Motivating the sequence

The first step in noticing the functional sequence comes from the observation that C dominates T, and T dominates V, in all languages for which these categories can be observed. The second step is to notice that Tense dominates Aspect, morphologically (Bybee 1985) as well as semantically (Comrie 1976) and that this is also reflected in the syntactic structure (Stowell 1993, Demirdache and Uribe-Etxebarria 2000). The morphology-syntax isomorphism is sometimes called the Mirror Principle (Baker 1985), and the syntax-semantics isomorphism is sometimes loosely referred to as compositionality.

More generally, much of the evidence for the finer-grained functional sequence comes from the observation that if a pair of syntactically similar elements A and B (e.g. two auxiliaries, two adverbs, two verbal suffixes) which have semantic meanings α and β respectively appear in a rigid configuration in which the A dominates or c-commands B, then this will be true for the expressions corresponding in meaning to α and β in all languages (Alexiadou 1997, Cinque 1999).

For example, Cinque (1999:54) shows that in Turkish, a future suffix can appear outside an ability modal suffix, as shown in (22).

(22) Oku-y-abil-ecik-ti-m.
read-y-MOD-FUT-PAST-1SG
'I was going to be able to read'/'I would be able to read' (Turkish)

In Haitian Creole, a preverbal future particle can precede a preverbal ability modal marker.

(23) Žã ap ka vini.
Jean FUT *can come*
'Jean will be able to come' (Haitian Creole, Cinque 1999:62)

In Norwegian, a future auxiliary can precede an ability modal auxiliary.

(24) Jan vil kunne komme.
Jan FUT *be.able come*
'Jan will be able to come' (Norwegian)

It is generally difficult to find examples of the opposite order: a future suffix inside an ability suffix, a preverbal future particle after a preverbal ability particle, or a future auxiliary structurally closer to the main verb than an ability auxiliary. On the basis of such observations, Cinque postulates that a sentential functor T(Future) dominates another one Mod_{root} in the

functional sequence.

In some cases, Cinque finds that two elements can occur in either order, for example the adverbs *spesso* 'often' and *già* 'already' in Italian.

(25) a. (Quando troviamo qualcosa) questa è spesso già stata
when find something this is often already been
scoperta da qualcuno.
discovered by someone
'When we find something, this has often already been discovered by someone'

b. Questa proprietà è già stata scoperta spesso, negli
this property is already been discovered often in.the
ultimi cinquant'anni.
last fifty-years
'This property has already been discovered often, in the last fifty years' (Italian, Cinque 1999:92)

In such cases, the functional sequence might simply not order these elements; alternatively, there might be differences in the interpretation of the two cases. Cinque suggests in this case that *spesso* 'often' can be attached in two different places, which he calls $\text{Asp}_{\text{frequentative(I)}}$ and $\text{Asp}_{\text{frequentative(II)}}$. See Ernst (2002) for an extensive evaluation of this strategy, and an alternative which loosens the tightness of fit between individual adverbs and positions in the clause structure. See also Nilsen (2003) for an argument that in some cases, such properties as polarity are responsible for adverb orderings, rather than syntactic placement.

But neither Ernst nor Nilsen abandons the functional sequence entirely, in their explanations of adverbial orderings (see Morzycki 2005 for discussion). The functional sequence thus has semantic content and syntactic consequences. How it is derived is an open question. For the purposes of the present paper I will simply assume there to be some important ordering for an interesting set of syntactico-semantic categories.

Another open question is to what extent the categories must exist in every language, or every structure. Cinque (1999) and Starke (2004) discuss the matter. For present purposes, it can be assumed that the functional sequence is a constraint on possible hierarchical orderings; if a language distinctly manifests future and root modality, it will order them in the way dictated by the functional sequence.

4.2. Identifying the sequence

Putting together the disparate examples of pairwise combinations, Cinque (1999) divides up the coarse-grained T domain into many smaller domains; these are organized in (26), based on Cinque (1999:131), with examples of English adverb where possible (the subgroupings and boldface labels are my addition).

(26) a. **Speaker comment**
  (i) $\text{Mood}_{\text{speech act}}$ (*frankly*)
  (ii) $\text{Mood}_{\text{evaluative}}$ (*fortunately*)
  (iii) $\text{Mood}_{\text{evidential}}$ (*allegedly*)

b. **Epistemic Modality**
  $\text{Mod}_{\text{epistemic}}$ (*probably*)

c. **Tense**
  (i) T(Past) (*once*)
  (ii) T(Future) (*then*)
  (iii) $\text{Mood}_{\text{irrealis}}$ (*perhaps*)

d. **Root and Alethic Modality**
  (i) $\text{Mod}_{\text{aleth necess}}$ (*necessarily*)
  (ii) $\text{Mod}_{\text{aleth possib}}$ (*possibly*)
  (iii) $\text{Mod}_{\text{volition}}$ (*intentionally*)
  (iv) $\text{Mod}_{\text{obligation}}$
  (v) $\text{Mod}_{\text{ability/permiss}}$

e. **Outer Aspect**
  (i) $\text{Asp}_{\text{habitual}}$ (*usually)*
  (ii) $\text{Asp}_{\text{repetitive(I)}}$ (*again*)
  (iii) $\text{Asp}_{\text{frequentative(I)}}$ (*often*)
  (iv) $\text{Asp}_{\text{celerative(I)}}$ (*quickly*)
  (v) T(Anterior) (*already*)

f. **Perfective/Imperfective**
  (i) $\text{Asp}_{\text{terminative}}$ (*no longer*)
  (ii) $\text{Asp}_{\text{continuative}}$ (*still*)
  (iii) $\text{Asp}_{\text{perfect}}$ (*always*)

g. **Durative/Progressive**
  (i) $\text{Asp}_{\text{retrospective}}$ (*just*)
  (ii) $\text{Asp}_{\text{proximitative}}$ (*soon*)
  (iii) $\text{Asp}_{\text{durative}}$ (*briefly*)
  (iv) $\text{Asp}_{\text{progressive}}$ (*characteristically*)

h. **Voice**
  (i) $\text{Asp}_{\text{prospective}}$ (*almost*)
  (ii) $\text{Asp}_{\text{completive}_{\text{Sg}}}$ (*completely*)
  (iii) $\text{Asp}_{\text{completive}_{\text{Pl}}}$
  (iv) Voice (*well*)

i. **Event Description**
  (i) $\text{Asp}_{\text{celerative(II)}}$ (*fast/early*)
  (ii) $\text{Asp}_{\text{repetitive(II)}}$ (*again*)
  (iii) $\text{Asp}_{\text{frequentative(II)}}$ (*often*)
  (iv) $\text{Asp}_{\text{completive(II)}}$ (*completely*)

Highly relevant to the study of complex predicates is the discussion in Cinque (2004) of restructuring verbs in Italian. There, he argues that restructuring verbs occupy functional positions outside the verb phrase,

and hence are essentially like auxiliaries, despite having richer descriptive content than we usually associate with auxiliaries.

The verbs he discusses are the following.

(27) a. $\text{Asp}_{\text{habitual}}$ (*solere* cf. 'used to')
b. $\text{Asp}_{\text{predispositional}}$ (*tendere* 'tend')
c. $\text{Mod}_{\text{volitional}}$ (*volere* 'want')
d. $\text{Asp}_{\text{terminative}}$ (*smettere* 'stop')
e. $\text{Asp}_{\text{continuative}}$ (*continuare* 'continue')

In order to see how the functional sequence constrains complex predicates more generally, we would like to know what it says about such categories as benefactives, instrumentals, locatives, and so on. In a careful study of the relative order of prepositional phrases in the German Mittelfeld, Schweikert (2005) motivates the hierarchy in (28) (except that the order of Path, Instrument, and Means was not entirely clear from the tests). I give translations of examples of the kinds of prepositional phrases used by Schweikert in parentheses.

(28) a. Evidential ('according to a witness')
b. Temporal ('on his birthday')
c. Locative ('in each country')
d. Comitative ('with Helga')
e. Benefactive ('for Mr. Müller')
f. Reason ('because of the light')
g. Source ('from Munich')
h. Goal ('to Venice')
i. Malefactive ('against the bad weather')
j. Path ('through Mainz')
k. Instrument ('with a saw')
l. Means ('by bus')
m. Matter ('about literature')
n. Manner ('with care')

As Schweikert shows, the actual surface order of PPs is quite free, and careful tests were necessary to establish the base order.

The hypothesis is that this hierarchy reflects the same functional sequence studied by Cinque (notice the evidential and temporal categories at the top), but introduces some categories not identified by Cinque because of the way prepositions introduce noun phrases; thus, for example, a substantial part of the Schweikert hierarchy might identify relatively low parts of the structure not fully identified by the kinds of functors studied by Cinque.

It is interesting to compare the hierarchy of depictives suggested by Schultze-Berndt and Himmelmann (2004). They examined languages to see whether a particular class of adjunct showed signs of being argument-

oriented, for example having agreement controlled by an argument. For example, in four of eight Australian languages examined, a locative expression like 'along the road' showed signs of being predicated of an argument, hence was depictive-like (as in (29), where the locative element shows dative agreement), and in the other four languages it did not, hence was presumed adverbial if the language otherwise showed agreement on depictive predicates.

(29) Karnta-ngku ka-rla kurdu-ku miyi yi-nyi
woman-ERG PRS-3IO *baby*-DAT *food* *give*-NPST
parraja-rla-ku.
coolamon-LOC-DAT
'The woman gives the baby food in the coolamon (carrier dish)'
(Warlpiri, Simpson 1991:206)

They identified eight semantic categories, which I organize in (30) in a way slightly different from the ordering presented by Schultze-Berndt and Himmelmann. In each example, the first number is the number of languages (out of eight) showing agreement, hence indicating a depictive construction, and the second number is those languages showing absence of agreement, suggesting an adverbial construction. After the numbers are given approximate translations of examples used by Schultze-Berndt and Himmelmann.

(30) a. Time (2/6) ('today'; 'nightly')
b. Phase/Role (2/3) ('as a child')
c. Location (4/4) ('along the road'; 'in the coolamon')
d. Manner (6/2) ('desperately'; 'tightly')
e. Concomitance (7/1) ('with dogs')
f. Comparison (4/0) ('like a horse')
g. Quantity (5/0) ('pairwise'; 'as two')
h. Condition/State (8/0) ('angry'; 'drunk')

Here, we see again that time is at the top, and since phase/role is about a property holding at a given time, it is not surprising that that should pattern similarly. Location is below those two, and concomitance (comitative) is lower still, as they are in Schweikert's hierarchy. However, manner is higher than concomitance, which apparently represents a mismatch, but this might be because different categories are being called 'manner' in the two cases. The other categories are not part of Schweikert's (or Cinque's) studies. Nonetheless, an interesting hypothesis would be that this hierarchy reflects the functional sequence, and shows that languages will tend to use adverbial strategies at the top of the hierarchy and depictive strategies at the bottom.[1]

[1]In fact, Schultze-Berndt and Himmelmann suggest that *contiguous* stretches of the hierarchy will be expressed using the same strategy in a given language. Here are the patterns they report, for Wardaman, Jaminjung, Diyari, Gooniyandi, Kayardild, Mar-

There is an important part of the clause that the functional sequences so far examined are not fully explicit about, namely the verb phrase itself. For this I turn to Ramchand (2008) (see references there for other examinations of the decomposition of the verb). Ramchand proposes a tripartite division of the verb into Initiation, Process, and Result, or INIT, PROC, and RES for short. These heads are strictly ordered, with INIT over PROC over RES.

The initiation layer corresponds to Harley's (1995) *v* or Kratzer's (1996) Voice, as it introduces the external argument when there is one and corresponds to the initiating subevent of an activity, accomplishment, or achievement. It is absent from unaccusative verbs, which are taken to have no initiating subevent.

The process layer corresponds to the durative run-time of an event, even if it is negligible, as in an achievement. The element undergoing the process occupies or passes through the specifier of this projection.

The result layer corresponds to the end state, if one is specified by the verb (a typical activity has no end state, hence no result projection). The element which enters or holds this state must occupy or pass through the specifier of RES. Importantly, if a single element both undergoes a process and achieves a result state, it will have to move from the specifier of RES to the specifier of PROC.

Lexical material which contains encyclopedic information, such as the difference between sliding and rolling or between laughing and coughing, can be associated with these structures. Verbs like *laugh* and *cough* bear an INIT feature, while *roll* and *slide* do not, so they will behave differently syntactically; but if *laugh* and *cough* have exactly the same featural specifications, and are inserted into exactly the same trees, then there can be no syntactic differences between them. Thus a strict separation is assumed between syntax and semantics, mediated by an interface of which the functional sequence is a part.

The structures are comparable to Baker and Harvey's (2006) Jackendovian Lexical-Conceptual Structures. There are two differences: one, the mapping rules are universal, rather than language-specific, so that any differences across languages has to be stated in properties of individual lexical items which are used to lexicalize the tree structures, including possibly

tuthunira, Warlpiri, and Yankunytjatjara, rearranged to match the hierarchy posited in (30), which is slightly different from their hierarchy.

	WARD	JAM	DIY	GOON	KAY	MART	WARL	YAN
Time	–	–	–	–	–	–	(+)	(+)
Phase/Role	–	–	–	?	?	+	?	+
Location	–	–	–	–	+	+	+	(+)
Manner	–	–	+	+	+	+	+	+
Concomitance	–	+	+	(+)	+	(+)	+	+
Comparison	?	+	?	+	?	+	?	+
Quantity	?	+	?	+	+	+	?	+
Condition/State	+	+	+	+	+	+	+	+

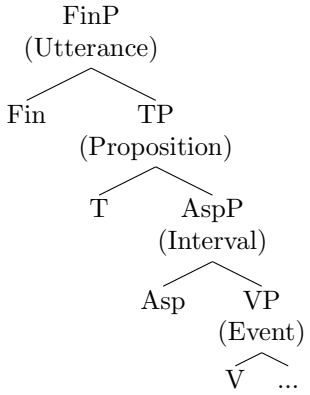
A question mark indicates lack of relevant data, + means obligatory agreement, (+) means optional agreement, and – means no agreement.

movement of surface forms. Two, the principles are completely general, and apply equally to the functional structure dominating the verb phrase; the strict ordering of INIT, PROC, and RES is assumed to be part of the same fact that orders Epistemic modality above Tense above Root modality and habitual above volitional above terminative.

4.3. A formal representation

For the sake of clarity, I sketch in very general outline a way in which these categories could be handled formally. Suppose we focus on four large divisions of the clausal structure, something like an utterance (corresponding to (26a)), a proposition (approximately, (26c)), a type of temporal interval (cf. (26e)), and the event ((26i)).

(31)



Suppose we model each description as a set of objects of different types, using variables e for events, i for intervals, p for propositions, and u for utterances.

Now, each functional head in the functional sequence can be assumed to do four things. It must [i] introduce an argument position of the relevant type, and [ii] express a relation between that argument and the complement. It must also [iii] existentially close the complement. Finally, I will assume that it also [iv] provides some way for the language-specific vocabulary to specify whatever aspects of meaning may vary from one language to the next.

The functional heads in the tree above could then be assigned denotations as in (32).

(32) a. $[\![\text{V}]\!] = \lambda\text{e}[\text{PROCESS}(\text{e})]$
b. $[\![\text{Asp}]\!] = \lambda\text{P}\lambda\text{i}\exists\text{e}[\text{R}_{\text{Asp}}(\text{i,e}) \wedge \text{P}(\text{e})]$
c. $[\![\text{T}]\!] = \lambda\text{P}\lambda\text{p}\exists\text{i}[\text{R}_{\text{T}}(\text{p,i}) \wedge \text{P}(\text{i})]$
d. $[\![\text{Fin}]\!] = \lambda\text{P}\lambda\text{u}\exists\text{p}[\text{R}_{\text{Fin}}(\text{u,p}) \wedge \text{P}(\text{p})]$

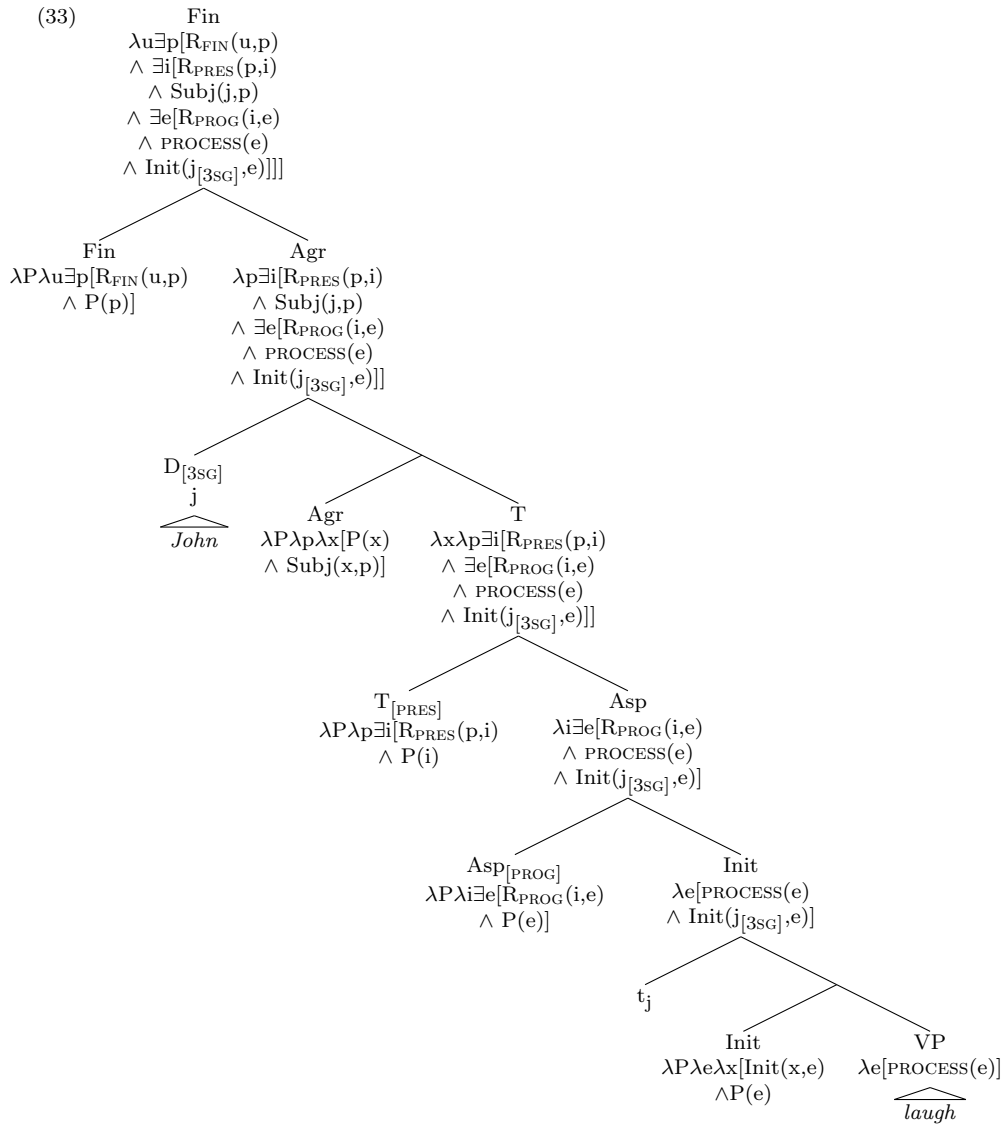
For instance, Asp would [i] introduce a variable over temporal intervals. It would also [ii] specify the relationship of the temporal interval to the event description that it takes as a complement. Whatever is not in the semantics of the functional head itself will have to be specified by the language-specific vocabulary, [iv]. The Asp head would also [iii] introduce existential closure over events. Thus, if progressive aspect, for example, is different from other aspects only in the conceptual domain differentiated by vocabulary items, then its semantic representation could remain abstract and simple.

More concretely, take the sentence *John is laughing*. The event description is *laugh*, which we could simply call an activity for present purposes. The aspect is progressive. The tense is present, which means that the reference time is identical to an anchor time. The clause is finite, meaning that the anchoring is deictic (in this case, picked out by the time and place of the speaker's utterance).[2]

Syntax combines these functors to give a tree like the following. I include the subject, introduced by the functor Init discussed below, and then given a discourse interpretation by an 'Agr' head (Chomsky 1993, Watanabe 1993, Adger 1994). Cinque (1999) suggests that argument licensing positions like Agr are not universally ordered in the functional sequence, so that languages may vary in where arguments are overtly licensed (see also Bentzen 2007 for variable subject licensing positions in Norwegian).

[2]For a theory of the semantics of finiteness, see Bianchi 2003, and for its syntactic significance and position in the clause, see Holmberg and Platzack 1995, Rizzi 1997, Adger in press. For the Post-Davidsonian semantics of the verb phrase, see Ramchand 2008.

(33)



Here u would be existentially closed at the utterance level. The denotation can be read (from the bottom up) 'there is an event e, such that e is a process and John is the initiator of e; there is an interval i, such that the i is in the PROG aspectual relation with e; there is a proposition p which is in the PREStense relationship with i, and the subject is John; and p is in the Fin relationship with u.'

Conceptual information would be associated with the different parts of the structure through lexical insertion, so that the event would be identified as a laughing event, the aspect as progressive, and so on. If the sentence

is a matrix sentence, then the deictic anchoring is to the time and location of the utterance by the speaker.

On this representation, the only role for feature labels like [PROG] in the syntax is for copying, in case there is verb-form agreement, for selection, in case there are adverbials that are sensitive to such features, and for lexical insertion, to ensure that the morphemes inserted are compatible with any other properties of that particular feature.

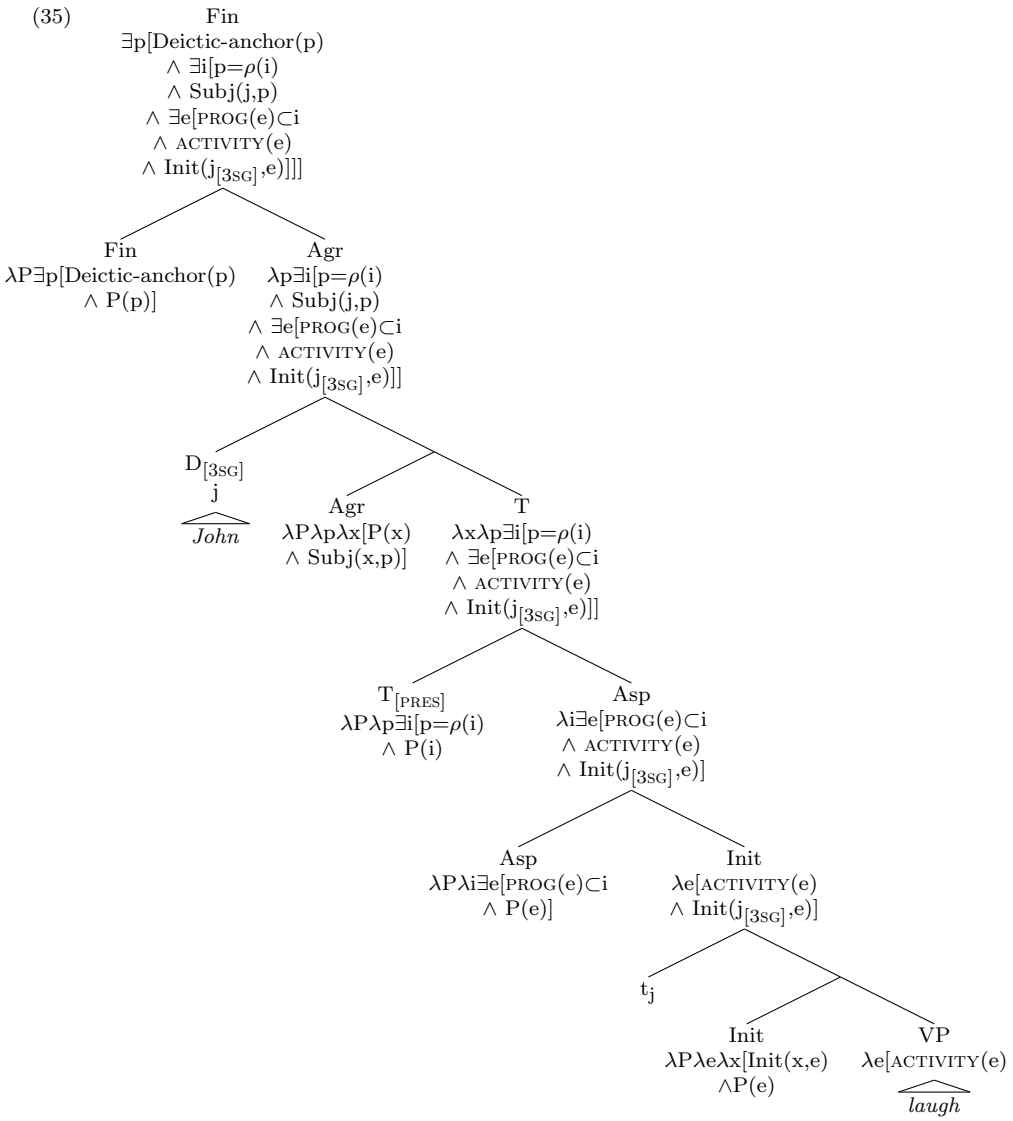
Alternatively, the specifically progressive semantics could be represented more directly in the tree, e.g. as in (34), where the interval is stated to be a part of the run-time of the event.[3]

(34) $[\![\text{Asp}_{[\text{PROG}]}]\!] = \lambda P \lambda i \exists e[\text{PROG}(e) \subset i \wedge P(e)]$

This sort of assumption gives a tree like the following (I have also eliminated the u variable from this variant).

[3]For tense and aspect semantics, see Reichenbach 1947, Krifka 1992, Stowell 1996, Giorgi and Pianesi 1997, Demirdache and Uribe-Etxebarria 2000, Ramchand 2004.

(35)



This tree makes explicit some of the expansions that the nodes are assumed to undergo in the semantic representation. The denotation can be read (from the bottom up) 'there is an event e, such that e is a process and John is the initiator of e; there is an interval i, such that the progression of e is contained within i; there is a proposition p in which i holds at the anchor time and place, and the subject is John; and the anchor is deictically fixed.'

If the details distinguishing (32b) and (33) from (34) and (35) are not relevant to syntactic operations in any language, then the details of (34)

and (35) are more appropriately assumed to be inserted along with the vocabulary item pairing sound and conceptual content into the syntactic tree, after syntactic operations have taken place.

Given a model something like one of the two variants just presented, certain restrictions on predicate modification emerge. Suppose that adjunction gives conjunction of predicates (Chomsky 2004, Hinzen 2006). Then an open predicate over things of sort i adjoined to AspP will add its interpretation to that of the main predicate. For example, if *already* with a denotation λi[*already*(i)] is adjoined to AspP, it will yield (36).

(36) $\exists$p[Deictic-anchor(p) $\wedge$ $\exists$i[p=ρ(i) $\wedge$ Subj(j,p) $\wedge$ *already*(i) $\wedge$ $\exists$e[PROG(e)$\subset$i $\wedge$ ACTIVITY(e) $\wedge$ Init(j,e)]]]

Translating into a flat semantic structure of the usual sort, it would be unclear why it should matter where *already* is merged. However, if the semantics is read directly off of the syntactic structure as I have outlined, then the interpretive algorithm would naturally require *already* to be merged at AspP, no higher and no lower. If *already* were to merge too low, there would be no i variable for it to combine with, and it would have to be interpreted as a property of events, perhaps infelicitously. If *already* attached too high, the i variable would already be existentially bound, and it could only be interpreted as a property of propositions.

There is good evidence that adverbial modification is highly sensitive to syntactic structure (e.g. von Stechow 1995; 2003). Thus, I assume that the interface between syntax and semantics constrains the attachment of modifiers, perhaps along the lines sketched here.

5. Revisiting the variation

Armed with a universal and rigid functional sequence governing clause structure, we can revisit the question of the analytic space for complex predicates. The general space was outlined in (1), (10), and (12) above, repeated below as (37)–(39).

(37) Main classes of complex predicates
- a. Lower predicate is complement of higher predicate
- b. Lower predicate is adjunct, predicated of the event
- c. Lower predicate is adjunct, predicated of an argument

(38) Analytic options for adjunct secondary predicates
- a. How high is the adjunct attached
- b. How much functional structure dominates the adjunct

(39) Analytic options for complement secondary predicates
- a. What is the categorial status of the higher predicate
- b. How much structure does the lower predicate project

The distinctions in (37) now make more sense. First, the complement configuration is assumed to be primitive anyway. Adjuncts must be connected to the main predication by binding argument positions, and the argument positions that functors like T, Asp, and V make available correpond to propositional, temporal, and event modification, loosely characterized in (37b) as 'predicated of the event.' The introduction of argument positions by heads like Agr in (33) means that there is another way for an adjunct to attach to the structure, because there is another kind of variable which is available, namely the argument variables. This correctly predicts the class of modifiers in (37c).

The distinctions in (38) and (39) now look much different. The functional sequence, by hypothesis, manifests a strong correspondence between height in the clause and meaning. Epistemic modality, tense, desiderative notions, causation, and resultativity all have their places in the structure. The question of how high an adjunct is attached will be directly related to how it is interpreted.

Similarly, for the higher predicate, its location in the functional sequence will directly determine a major component of its meaning. For the lower predicate as well, the amount of structure dominating it will be directly determined by what it means, as when Baker and Stewart (2002) show that a purposive has an irrealis interpretation and also contains some kind of tense or mood operator (as signalled by high tone in Edo, cf. (9)). Below I present a proposal that will constrain these analytic choices further.

5.1. Capturing the regularities

First, consider the distribution of tense and aspect. The highest verbal head will combine with T, if T is lexicalized by a bound morpheme. Thus, T inflection is a very good indication of the relative height of two verbal elements. Similarly for aspect. A verbal element appearing below both tense and aspect might have both as affixes, while an element appearing below tense but above aspect could have a tense suffix but not an aspect suffix. Thus, the hierarchy is extremely important in determining which of several pieces of a complex predicate is tense or aspect marked, and as a result the distribution of tense and aspect marking is a good clue to the learner about the structure. The system is made substantially more predictive if strict constraints on movement are adopted, for example the head movement constraint (Travis 1984, Baker 1988, Rizzi 1990, Julien 2002), which strictly limits morphological incorporation to the heads of elements in a head-complement relation.

5.1.1. Auxiliaries

The pattern is clearly displayed by Finnish, where the same affixes attach to main verbs and to auxiliaries. In (40) can be seen the simple present and perfect forms, in affirmative clauses.

(40) a. Nous-i-n.
get.up-PAST-1SG
'I got up'
b. Ol-i-n nous-sut.
be-PAST-1SG *get.up*-PERF
'I had gotten up' (Finnish, Holmberg et al. 1993)

As indicated, the tense and subject agreement suffixes attach to the main verb in the simple aspect, and to the auxiliary in the perfect. (40a) represents a hierarchical structure Agr > T > V, and (40b) a structure Agr > T > Aux > Asp > V, where Aux might be inserted for purely morphological reasons, for example if the T suffix cannot attach to Asp.

In Finnish, negation is expressed by an auxiliary, and in (41), it can be seen that the subject agreement appears on this auxiliary when it is present. In the presence of the auxiliary, there is a nonfinite form of the main verb.

(41) a. E-n nouse-t.
NEG-1SG *get.up*-NONFIN
'I don't get up'
b. E-n ole nous-sut.
NEG-1SG *be* *get.up*-PERF
'I haven't gotten up' (Finnish, Holmberg et al. 1993)

Thus, assuming that the perfect auxiliary is only inserted for morphological reasons, a hierarchical structure can be discerned which is either Agr > Neg > T > Asp > V (if the negative auxiliary moves across the agreement) or else Neg > Agr > T > Asp > V (if it doesn't).

There is also a conditional mood affix. It can appear on a main verb, but if the perfect auxiliary is present it appears on that.

(42) a. Nous-isi-n.
get.up-COND-1SG
'I would get up'
b. E-n nous-isi.
NEG-1SG *get.up*-COND
'I wouldn't get up'
c. Ol-isi-n nous-sut.
be-COND-1SG *get.up*-PERF
'I would have gotten up'
d. E-n ol-isi nous-sut.
NEG-1SG *be*-COND-1SG *get.up*-PERF
'I wouldn't have gotten up' (Finnish, Holmberg et al. 1993)

We can see that the conditional head must be below negation and the agreement, but above Asp, giving {Agr,Neg} > {T,Mood} > Asp > V.

5.1.2. Preverbal particles

Non-affixal particles expressing evidentiality and other such high-level notions will be understood by the learner to lexicalize a high part of the clause; see Cinque (1999) and Julien (2002) for examples (cf. also (9) and (13) above).

Similarly, since temporal and modal notions are defined over propositions, any non-affixal particle expressing modality will be relatively high up.

5.1.3. Modals

Modal notions are defined over modal bases (see Condoravdi 2002, Condoravdi et al. 2006). If the syntactic structure corresponds to semantic interpretation, then modals will necessarily be lexicalized in the appropriate parts of the clause structure. Butler (2006) points out that the systematic alternation, cross-linguistically, between epistemic and root meanings for the same modal elements can be understood in terms of the same morpheme being able to lexicalize two different parts of the functional sequence.

(43) a. Avan angke pooka-ñum.
he *there* *go*-DEB
'He must go there'

b. Gañeecan Mannarkuṭikki pooyi-rukka-ñum.
Ganesan *Mannargudi.*DAT *go*-PERF-DEB
'Ganesan must have gone to Mannargudi' (Tamil, Butler 2006:162)

5.1.4. Volition and Intention

Another class of notions that is often grammaticized is that concerning volition, intention, control of an action, effort exerted, and so on. These can be conceptualized either as embedding whole propositions (in which case they are expressed in biclausal structures) or, more relevantly here, as being properties of what Jackendoff (1995) calls 'actional attitudes.' Suppose some intermediate sized part of the functional sequence corresponds to such a notion, then a verb might diachronically be reanalyzed as lexicalizing the relevant part of the sequence (perhaps along with an Agr node, allowing certain entailments to be expressed about a subject argument), and would then be what Rizzi and Cinque and others have called a restructuring verb.

5.1.5. Other restructuring verbs

Other kinds of restructuring verbs often express aspectual notions such as inception, termination, continuation, or habituality. It is easy to see how these notions would be understood by the learner as having certain appropriate places in a decomposition of the clause like the one presented here.

For example, Lehmann (1990) shows how aspectual notions which are expressed in Spanish with verbal elements are expressed in German by adverbial elements (all examples from Lehmann 1990:176).

(44) a. Juan fué comprendi-endo la historia.
Juan went understand-PROG *the story*
'Juan understood the story little by little' (Spanish)
b. Hans verstand die Geschichte nach und nach.
Hans understood the story after and after
'Hans understood the story little by little' (German)

(45) a. Juan acabó ley-endo todo el libro.
Juan ended read-PROG *all the book*
'Juan ended up reading the whole book' (Spanish)
b. Hans las schließlich das ganze Buch.
Hans read finally the whole book
'Hans ended up reading the whole book' (German)

The above examples combine with the progressive form of the Spanish verb. Other examples involve a past participle or a prepositional element (examples again from Lehmann 1990:176).

(46) a. Juan anda preocup-ado con su hijo.
Juan walks worry-PTCPL *with his son*
'Juan is constantly concerned about his son' (Spanish)
b. Hans ist ständig in Sorge um seinen Sohn.
Hans is constantly in worry about his son
'Hans is constantly concerned about his son' (German)

(47) a. Juan continuó a leer.
Juan continued to read
'Juan kept on reading' (Spanish)
b. Hans las weiter.
Hans read further
'Hans kept on reading' (German)

(48) a. Juan acaba-ba de leer el libro.
Juan end-IMPF *of read the book*
'Juan had just read the book' (Spanish)
b. Hans hatte soeben das Buch gelesen.
Hans had just.now the book read
'Hans had just read the book' (German)

A very similar example like the following (also from Lehmann 1990:176) would normally be classified as an auxiliary construction, suggesting that the cut-off between auxiliary and restructuring verb might be a matter of definition.

(49) a. Juan está ley-endo un libro.
Juan is read-PROG *a book*
'Juan is reading a book' (Spanish)
b. Hans liest gerade ein Buch.
Hans reads straight a book
'Hans is reading a book' (German)

In each case, the German adverb would attach at the same level as the corresponding Spanish finite verb, and express approximately the same features, but as an adjunct, hence not in the projection line for the tense. There is a sense in which the adverb is 'optional,' but the finite verb in the Spanish examples is optional in exactly the same way, except that its absence has consequences for the finiteness of the main verb; whatever verbal element is highest will move up — a desiderative, a causative, a permissive, a light verb, or the main verb.

5.1.6. Light verbs

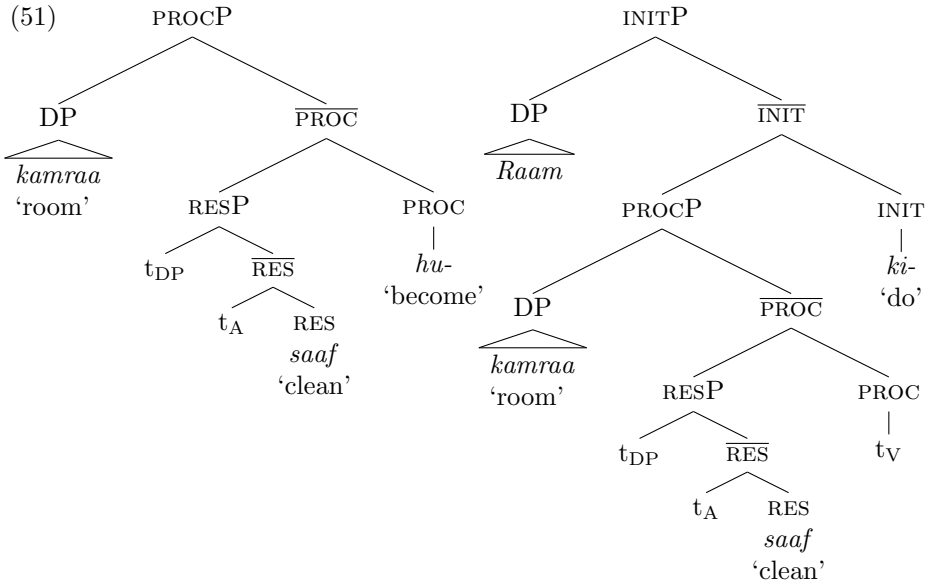
Light verbs are different from auxiliaries, modals, and restructuring verbs in that they interact more closely with the lexical semantics and category of the lower predicate. In many languages, they are highly sensitive to the argument structure of the verb phrase as a whole, and in many cases they may allow or even require the lower predicate to belong to a category other than verb.

The examples in (17) are repeated here in (50).

(50) a. Kamraa saaf huaa.
*room.*N *clean happen/become.*PERF
'The room became clean'
b. Raam-ne kamraa saaf kiyaa.
Ram-E *room.*N *clean do.*PERF
'Ram cleaned the room' (Hindi/Urdu, Mohanan 1994:201)

An analysis based on that in Ramchand (2008) is sketched in (51).

(51)



Since the argument structure is determined by the heads INIT, PROC, and RES, the fact that the light verb lexicalize these heads means that they determine the argument structure. Since the adjective is the complement of the verb, its category can be selected, on standard assumptions about complement selection.

Butt's Generalization is the observation that light verbs can always also be used as full lexical verbs. The explanation for this has been proposed by Ramchand (2007), namely that if a verb has the features to lexicalize material in the VP domain (i.e. below the functional structure that expresses properties of intervals and so on), then nothing can prevent it from appearing with arguments directly, since it is the material in the VP domain which licenses arguments.

Of course, a bound morpheme might require a host, so an affix with the same effect as a light verb could fail to appear on its own, but for morphological reasons.

The elements governed by the functional sequence, if realized as heads in the projection line, have a tendency to be relatively bleached of rich encyclopedic content. Content words like noun, main verbs, and adjectives will either be introduced at the bottom of the functional sequence or else will be introduced as phrasal dependents.

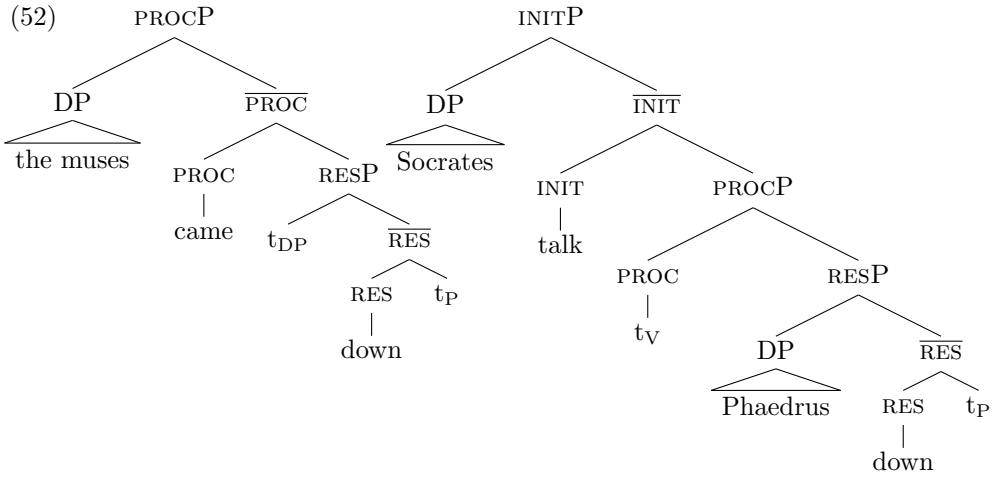
5.1.7. Resultatives

Resultatives have a special place at the end of the line. Thus they have an option the other positions don't have, namely to be the complement of a lexical verb (one which characterizes a process). This is why there are

unselected resultatives and no unselected desideratives, modals, and so on.

The analysis of the English verb-particle construction, a kind of resultative, is sketched in (52) (based on that in Ramchand and Svenonius 2002). This should be compared to (51) above.

(52)



5.1.8. Serial verbs

Why are serial verbs normally possible only in languages in which tense is non-affixal, or in constructions in which tense is non-affixal? This is a very interesting question, and the answer will have to take into consideration the apparent counterexamples. Tentatively, I suggest the following.

A verb, more or less by definition, has an event variable which must be bound somehow. One way is by Asp, another is by nominalization.

A serial verb must be attached where there is an open variable for it to share, as detailed in §2.2. If this open variable is the event variable, or an argument position, then the adjunction must be relatively low, before the event variable has been bound by the Asp head.

In a language in which T or Asp is affixal, the verb is attracted up to adjoin to it. If a phrase with exactly the same category, i.e. VP is adjoined to the main VP, then by the relativized minimality of feature attraction (Rizzi 1990, Starke 2001), the adjunct VP will be closer to the attractor than the head VP. There are various reasons to think that this might go wrong. For example, if the affix must be satisfied by head movement and the adjunct cannot undergo head movement, the derivation will crash. If the adjunct can undergo head movement but only the moved verb has its variable bound, then the main verb will have an unbound variable and the derivation will crash.

5.1.9. Depictives and Adverbials

As already noted, the two different kinds of variable that are introduced in the semantic composition of the clause are those corresponding to arguments and those corresponding to the event in a broader sense, meaning the event, interval proposition, or whatever it is. I suggest that depictives and adverbials represent different strategies for introducing optional descriptive material into the clause; an adverbial or depictive is typically a descriptive word with some functional support which allows it to predicate of a variable at the right level of the clause.

5.2. Illustrations

In §2.2, I argued that at least three different kinds of structural configuration were needed to describe the full range of complex predicates, illustrating the three kinds with resultatives.

One thing that the functional sequence predicts is that the three resultatives should all attached in the same region of the clause, since they all contribute meaning about an end state. A secondary predicate which expresses resultativity should not be able to attach to a projection of Asp or of T, for instance.

I have already shown some evidence that the prediction made is correct; resultative constructions, despite their variation, all show signs of being very low in the structure. Simpson demonstrated that resultatives, unlike depictives, cannot be stranded by VP-ellipsis. This turns out to hold even of spurious resultatives, as shown in (53a) ((53b) is a depictive, for comparison).

(53) a. ??I sliced the onions thin, but John did so thick.
b. I sliced the potatoes raw, but John did so boiled.

Baker and Stewart (2002) shows that in Edo, certain adverbs can intervene between a pair of consequential serial verbs, but no adverbs may be inserted between two verbs in a resultative serial verb construction.

(54) a. Òzó vbó ɔ̀khɔ́khɔ̀ ìgàn gíégíé khíén
Ozo pluck chicken feathers quickly sell
'Ozo plucked the chicken of feathers and quickly sold them'
b. Òzó fí àkhé (*gì́égì́é) guɔ̀ghɔ̀
Ozo throw pot quickly break
'Ozo threw the pot so that it (*quickly) broke'

Washio (1997) and Takamine (2007) show several tests that demonstrate that Japanese weak resultatives are tightly bound to the predicate, and similar demonstrations can be found for other languages.

This cross-linguistically tight connection between the result predicate and the process-describing verb follows from the fact that the resultative

layer of structure is very deeply embedded. Compare this with morphemes expressing volitionality, which as discussed above can be lexicalized as restructuring verbs. Since volitionality is something holding of a higher-order object than a resultant subevent, the functional sequence predicts, correctly, that morphemes expressing volitionality should be less tightly bound to the predicate, in fact they may take on nearly auxiliary status, and may then eventually be reanalyzed as tense expressions, as has occurred with the English modal *will*, which can express a pure future (as in *It will rain tomorrow*, where no volitionality is expressed).

6. Conclusion

The parametric theory of Chomsky (1981) held out the promise of greatly simplifying the learning of language. The idea was that all syntactic differences among natural language grammars could be characterized in terms of a relatively small set of parameters. Language learning would consist quite simply of setting the parameters on the basis of positive evidence. The parameters were imagined to be things like a pro-drop parameter (Rizzi 1982), an OV/VO parameter, a configurationality parameter (Hale 1983), a V2 parameter (den Besten 1981), a V-to-I parameter (Emonds 1978), a wh-movement parameter (Huang 1982), and so on.

More detailed investigations have determined that there are several types of pro-drop (Gilligan 1987), several types of OV language, several types of non-configurationality (Kiss 1995), several types of V2, several types of V-to-I, several types of wh-movement, and so on. Each parameter turns out upon closer inspection to fracture into smaller and smaller microparameters. Baker (2001) is still optimistic about this model of grammar, but for many, the failure of the linguistic community to converge on anything like a list of widely recognized parameters, after more than 25 years, is disappointing (Newmeyer 2004).

Many have turned to Borer's (1984) suggestion that all language variation might be restricted to the lexicon.

> "The inventory of inflectional rules and of grammatical formatives is idiosyncratic and learned on the basis of input data. If all interlanguage variation is attributable to that system, the burden of learning is placed exactly on that component of grammar for which there is strong evidence of learning: the vocabulary and its idiosyncratic properties. We no longer have to assume that the data to which the child is exposed bear directly on universal principles, nor do we have to assume that the child actively selects between competing grammatical systems." Borer (1984:29)

If this is the right tack, then we need to discover robust principles of universal grammar, because without such constraints, it is entirely unclear

how language learning proceeds.

I have tried, in this paper, to motivate the usefulness of a functional sequence of linguistic structure in understanding the universal grammar of sentence structure, by illustrating its application to complex predicates in a nearly pretheoretical sense. Much remains sketchy about the details, for example how fine-grained the hierarchy is, where it comes from, what aspects of it are subject to cross-linguistic variation, and so on.

The strongest version of the functional sequence hypothesis would be that there is one very finely grained functional sequence ordering all linguistically significant categories, somewhat like the way there is a strict and total ordering on all the elements, in the natural world. It is difficult to imagine how such a thing would evolve, as a property of the mind, but it is clear that it would greatly simplify the learning process.

More likely, the functional sequence is something weaker, a partial ordering on some interesting subset of linguistically relevant categories. Methodologically, however, it seems more fruitful to pursue the stronger hypothesis. In any case, much work remains to be done.

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